TRAUMATIC PYELOPARANEPHRIC CYST.[1]

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The facts of the case are as follows: The patient is a male, fifteen years of age, and was always perfectly well and sound up to his twelfth year, except for an attack of scarlet fever when very young. Parents perfectly healthy. Some time during his twelfth year, while shovelling snow, he was struck in the abdomen by the handle of the shovel, which necessitated confinement to bed for several days. After that time and until two weeks before admission to hospital, March 28, 1902, his health was good, except for a more or less continuous pain in the right side of abdomen.

Two weeks previous to admission, while attempting to jump on to a shed, the patient fell, his abdomen striking with considerable force on the edge of the roof of the shed. His condition required carrying home and going to bed, where he remained four or five days with nausea and vomiting during the first forty-eight hours, and with blood in his urine. The hæmaturia disappeared on the third day. After five days, the patient could get around the house, but abdominal pain persisted.

On date of admission, abdominal pain was intense, urine analysis was negative, general condition poor, and a small swelling was noticed in the right side of the abdomen on a level with the umbilicus. This swelling was dull on percussion; no record of further examination of this swelling, nor of temperature, was obtainable.

With hot local applications, etc., the condition became better until about the middle of April, when pain became intense, accompanied by abdominal distention.

An incision was then made over and down to the swelling, followed by incision into the same, which evacuated over a quart of bloody fluid containing several large blood-clots; while partial examination of the wall of the swelling showed it to be very thick and extending inward towards the kidney. A general diagnosis of cyst was therefore clear. The edges of the sac were then sutured to the edges of the abdominal incision and a tube inserted. The bloody fluid, according to pathologist's report, contained " no urine."

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From that time until just before I first saw the case in September, 1902, the patient's general condition improved, and the wound and cyst cavity contracted until a regular sinus was formed. The sinus formation was complete in about six weeks after the incision, and remained stationary from then until September, in spite of local stimulating injections. During this period urine flowed freely from the sinus, and repeated examinations were negative except for the presence of a fairly large number of leucocytes. Drainage tube had been removed permanently since the middle of July.

From about August 15 until October 1, however, there developed a series of " attacks," three or four in number, each attack consisting of high temperature (104° to 105° F.) ; some delirium ; pain and tenderness in and around the sinus, but no swelling ; and cessation of flow of urine from the sinus.

Each attack lasted about two days and yielded readily to cathartics and introduction of a drainage tube and irrigation, when the flow of urine would be resumed.

On recovery, patient's general condition was a little worse each time. It was therefore decided to explore the sinus with the idea of removing the cyst wall.

The operation was performed October 3.

A word more as to the urine. During an " attack," as just stated, no urine came through the sinus, but the urine from the bladder was uninfluenced thereby, both in quality and quantity, the latter having become almost as much as if both kidneys were normal. The amount of urine from the sinus between " attacks" was a little less than normal each day. This precluded any necessity for finding out the condition of the other kidney should nephrectomy of the kidney on the side of the sinus be decided upon.

The operation proved to be difficult and tedious. A careful dissection (1) showed that the sinus ran into a large cavity ; and (2) isolated enough of the cyst-wall of the latter for an accurate diagnosis of the actual conditions, accompanied as it was by a wide opening up of the orifice of the sinus.

The conditions found are indicated in the title. Thus: the cyst-wall, thick and dense connective tissue, was closely adherent to the surrounding paranephric tissue, beginning right at the orifice of the sinus, the partial isolating just referred to being followed constantly by profuse venous hæmorrhage. Following this wall in towards the kidney, the inner surface was also exposed and found to be covered by flabby granulations. These were scraped off, and then it was plain, by looking into the cavity, that the cyst-wall extended to and into the renal sinus. In other words, there was direct continuity of tissue between the paranephric-tissue part of the cyst-wall and the renal-pelvic portion thereof. Therefore there was a tear in the wall of the pelvis, and with each edge of the tear was connected a corresponding part of the paranephric cyst-wall. There was also considerable dilatation of the pelvis as a whole.

Hence, the cyst-wall was partly pelvis and partly thick condensed paranephric tissue, thus justifying the title, pyeloparanephric cyst.

Further confirmation was obtained by observing and probing two infundibula whose orifices opened proximally into the cyst cavity; and also by finding the opening of the ureter from within the cyst. A probe was passed into the ureter, but could go no farther than two or three inches, owing to thick granulation tissue in the lumen of the tube. Although tough, the cyst-wall was fairly elastic and was probably stretched by accumulation of urine during the attacks previously mentioned. There were also found a few ridges running in all directions around the inner surface of the cyst-wall, which might have caused the obstruction to the outflow of urine also mentioned as one of the phenomena of the "attacks." At all events, no other cause for this obstruction could be found.

These conditions, although serious, did not seem in themselves bad enough to account for the high temperature and delirium occurring in the "attacks," because the thickness of the cyst-wall was apparently sufficient to prevent any absorption of toxins or micro-organisms. This being so, one naturally would think of the kidney as causing these symptoms as the site of either a nephritis (with bacteria and bacterial toxins), or a condition in which toxins (non-bacterial) were being elaborated by faulty metabolism of the kidney-cells, the general condition then being an auto-intoxication rather than a septicæmia (or toxæmia) as it would be if the local condition were a nephritis.

The kidney was therefore partially exposed, and one or two small but deep incisions into it were followed only by blood. As no pus was found in the cavity of the cyst, this showed the probability of the nephritis being in the form of small foci of pus; since it seemed that the nephritis must be suppurative because of the severity of the general symptoms. The kidney could be palpated and was soft and large. Realizing that if small foci of pus were present, the other kidney might also be similarly affected, it was nevertheless felt that nephrectomy should be done, because of the progressive impairment of the patient's general health, and because the other kidney had shown absolutely no signs of any trouble at all.

Nephrectomy was accordingly performed. Many adhesions were found and much hæmorrhage occurred. An attempt was made to take out the entire cyst-wall with the kidney, but was abandoned, owing to adhesions and loss of blood. Therefore, the kidney, being now free, was removed, together with its adrenal body, the cyst-wall being cut right across at about its connection with the pelvic wall. Some two inches or so of the ureter below and outside of the cyst-wall were exposed and removed. There was now left in the wound only a good bit of the adherent original cyst-wall. The piece of ureter removed showed granulation tissue throughout; and the kidney on being split showed multiple pus foci, but almost of microscopic size. The pathologist confirmed the diagnosis, and also excluded tuberculosis both renal and ureteral. Any share in the cyst formation on the part of the kidney or adrenal body was also positively excluded. Most of the wound was sutured, a drain of gauze being inserted where cyst-wall was left.

Uneventful recovery except for wound. Thus, some six or eight weeks after operation the patient was in perfect health and had gained ten or twelve pounds. Locally, however, the wound had become a sinus with the usual small amount of seropurulent discharge. It showed no signs of healing in spite of the usual stimulating injections. A week later a piece of silk ligature came away. Still no advance for another week. Ether was then given and the sinus was laid open freely, and, as suspected, the remains of the cyst-wall were found just as large and tough as at the end of the first operation. Although hæmorrhage was profuse, there was no reason (the patient being in good condition) for stopping the operation and leaving any of the cyst-wall behind; so it was all dissected off and the wound partially sutured and partially packed with gauze. The patient was out of bed in three days, and the wound solidly healed at the end of two or three weeks.

Of course, the interesting and probably unusual aspect of this cyst is not that it was chiefly paranephric,—since paranephric cysts are fairly common,—but that the paranephric part was so closely connected with the renal pelvis that there was not only a cavity in common, but also a continuous cyst-wall, first of paranephric tissue and then of the pelvic wall. Just how unusual this condition may be I have been unable to find out; but that it is certainly uncommon may be inferred from as much of the literature as I have been able to look up. (See Bibliography at end of article.) The cause of the cyst, judging from the history and the findings, was undoubtedly traumatism; discussed more fully in later paragraphs. The research into the literature,—for most of which I wish to express my thanks to Dr. J. F. McCarthy of this city,—while not exhaustive, was thorough, and resulted in finding mention of many pathologic renal cysts; of a few traumatic renal or traumatic paranephric cysts; but no mention at all of pyeloparanephric cysts, either pathologic or traumatic.

An attempt will now be made to assign the cyst to its proper place among cysts in general and cysts of the "kidney region." Hence a short review is necessary of *cysts in general* and "renal cysts" (the last expression being used generically to express all cysts in the "kidney region," that is, cysts of the kidney, of the adrenal body, of the pelvis of the kidney, and of the paranephric tissue).

Beginning with *cysts in general,* there are three main classes: (A) Truly neoplastic cysts, that is, cysts which are really neoplasms, often called *cystomata;* (B) Parasitic cysts;

and (C) Cysts which are neither neoplastic nor parasitic. This classification, of course, also applies to cysts in the "kidney region."

(A) *Cystomata* or *Neoplastic Cysts.*—These are being considered more and more in connection with true solid neoplasms, with which they have far more in common both structurally and in etiology, than they have with "cysts." The structure of their walls, including that of the lining, is often quite complicated, so much so that the walls alone of a cystoma are almost, if not quite, identical with the structure of a solid neoplasm, thus differing entirely from the simple fibrous membrane of ordinary cysts or of the cyst which is the subject of this paper; while their contents is usually found to be made up of cell-elements mixed in with fluid or semi-solid tissue, very different from "serum" or "blood" of ordinary cysts. Many cystomata are also multilocular.

Coming to the "kidney region," the cystomata are exceedingly complicated, and their origin is only in the kidney or adrenal body, or both. This origin from the cells of the Wolffian body and other embryonic structures and from inclusions of "adrenal rests" shows their complicated nature. We may therefore safely exclude our cyst from the category of cystomata, especially of the kidney or adrenal body, if for no other reason than because no such findings resulted from the removal and examination of these structures.

(B) *Parasitic Cysts.*—This class needs only to be mentioned to be excluded from consideration. Even in the "kidney region," the kidney "adrenal" and ureter are out of the question, as the result of the operation shows. There remains the paranephric tissue, in which there may develop parasitic cysts; but the cyst under description is certainly not of that kind.

(C) *Cysts which are neither Neoplastic nor Parasitic.*—There are many varieties described, the chief difference between them seeming to be in many cases etiological rather than structural. The subdivisions generally accepted are: (1) Glandular retention cysts; (2) Cysts in pre-existing spaces other than the alveoli of glands; and (3) Cysts of new formation occurring where there are no pre-existing spaces.

(1) Glandular retention cysts. From the nature and history of the case, these cysts may be excluded; especially those of the kidney and "adrenal;" nor could the cyst have had its origin as a "retention cyst" of one of the minute glands in the wall of the pelvis. There are manifestly no glandular "retention cysts" of the paranephric tissue, that is primary ones.

(2) Cysts in "pre-existing spaces other than alveoli of glands." Among these are: distended bursæ; ganglia (of tendon sheaths); hydrocele, and hæmatocele; all comprising the "transudation cysts" of some authors. There should be added: dilated lymphatics (often called simple serous cysts or hygromata), and dilated blood-vessels or "blood-cysts." The last named must not be confounded with either hæmatoma (a cyst of new formation) or angioma (a neoplasm). Nor must the serous cysts be confounded with lymphatoma (a cyst of new formation) or lymphangiectasis (a neoplasm).

Referring to the "kidney region," and excluding "kidney" and "adrenal," there are the renal pelvis and the paranephric tissue, which may be the sites of these cysts.

Taking, first, the renal pelvis. The "pre-existing space other than alveoli of glands" would be the cavity itself of the pelvis. A cyst developing here might grow without involving kidney or ureter; or it might remain stationary; or it might involve the kidney or ureter; or its contents might break through the pelvic wall. Comparison with the cyst under discussion shows that a portion of it, *i.e.*, the part whose wall is renal pelvis, is identical with these cysts; or, in other words, is a cyst occurring in a "pre-existing space other than alveoli of glands."

Regarding, in the next place, the paranephric tissue. Part of the cyst occurred in this tissue. If it developed in a "pre-existing space other than alveoli of glands," the "space" would have to be the lumen of blood- or lymphatic vessels which are in the paranephric tissue. Against this possibility, however, are several objections: First, these "lymphatic or blood cysts" are rarely, if ever, found in a region subjected to such a severe traumatism as we know was inflicted on the patient. Secondly, these "lymphatic or blood cysts" are so slow in growth and possessed comparatively speaking of such a delicate wall that communication with the cavity of the renal pelvis through its tough fibrous wall could not be established traumatically without a traumatism so severe as to destroy the delicate cyst wall entirely. Furthermore, this statement includes an assumption of the existence of the cyst prior to the traumatism, of which there is absolutely no evidence. Again, the cyst wall found was anything but "delicate;" in fact, was as tough as the renal pelvis itself.

(3) Cysts of new formation, or those occurring where there are no pre-existing spaces. Among these are: hæmatoma; lymphatoma; a "cyst wall" of thickened tissue enclosing a foreign body; and "cysts of degeneration." All these cysts have a fairly thick capsule and one which is more or less distinct from the surrounding tissue. The contents is usually "serum;" and, if of long standing, it is often impossible to tell whether a cyst, with "serum" as contents, was originally a lymphatoma or a hæmatoma. "Cysts of degeneration" may be found in tendons as a variety of "ganglia" (distinct from that in tendon-sheaths already mentioned); or as a direct sequela to a "productive inflammation," in which case they are often multiple and small ("cystic degeneration" of some authors); they also occur in the tissue of some solid neoplasms.

In the "kidney region." Cysts of new formation in the kidney and "adrenal" may be absolutely excluded. In the pelvic wall have been recorded small cysts occurring from traumatism and containing blood; also cysts of degeneration. These may also be excluded.

In the *paranephric tissue,* on the other hand, "cysts of new formation" are fairly common as the result of severe traumatism, and may be lymphatomata, but are usually hæmatomata. When we consider the structure of such cysts and compare it with that of the cyst under consideration, it would seem certain that the latter, that is the larger part of it, is a "cyst of new formation" in the paranephric tissue.

Having now placed our cyst, with, as we know, its close relation to traumatism, in *two* subdivisions of cysts "which are neither neoplastic nor parasitic," a probably correct explanation of its method of formation may be had from a consideration of the etiology and method of formation of these cysts.

In the etiology of "cysts occurring in pre-existing spaces other than alveoli of glands" and of "cysts of new formation," traumatism is the most important factor, either as a predisposing cause or as a direct or exciting cause. This statement, though apparently simple, may lead to misapprehension; hence the following explanation: Cysts of these two subdivisions, when due to traumatism, are either recent or not. If *recent,* the contents (blood, serum, or traumatic œdema) is *directly caused* by the traumatism; but the capsule, as such, has not yet formed; and the "limiting wall" is simply the wall of the "space" (stretched or torn as the case may be) or the surrounding tissue (if no "space" exists). In this stage the cyst is not complete, *i.e.,* it has no capsule of its own.

If the cyst is not recent, its own capsule has had time to form, the formation consisting of a thickening of the tissue immediately around the contents and a differentiation, more or less complete, of the same from the more remotely surrounding tissue; all this is especially well marked in "cysts of new formation." This thickening, due to irritation from the presence of the contents, is regarded by some pathologists as a "productive inflammation;" but by others as a form of degeneration, *e.g.,* a "fibrosis." Furthermore, the contents also is apt to undergo changes, especially if blood (absorption of coloring matter, deposit of fibrin, etc.). Hence the traumatism, in these "complete" cysts, is predisposing, the exciting cause being the fluid first produced.

Referring now to the case described, and comparing with what we know of it that which has just been outlined, we may assume that: (*a*) the first traumatism ruptured the pelvis of the kidney and also caused a hæmatoma both within the pelvic cavity and in the paranephric tissue; (*b*) as time went on the blood was gradually absorbed, and the thickened capsule (extrapelvic portion) of connective tissue was formed (as just described) from the paranephric tissue; (*c*) the opening into the pelvis, however, remained, but the capsule (extrapelvic portion) was strong enough to hold any urine that might come through and prevent its extravasation; and (*d*) the second traumatism caused a fresh hæmatoma, partly by tearing the inner surface of the capsule as indicated by the ridges referred to in the history, and partly by causing small lacerations of the kidney.

Hence, as already stated in making the individual comparisons, we may repeat (1) that the cyst, or rather cyst wall, having two parts, the one (pelvic portion) corresponds to that of cysts occurring in "pre-existing spaces other than alveoli of glands" and the other (extrapelvic portion) corresponds to that of "cysts of new formation;" (2) that, as regards the cyst as a whole, both portions make a common capsule enclosing a common cavity; and (3) that traumatism was the predisposing cause.

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A summary of what was found is given in the article, from which it is seen that nothing really bearing on the case is recorded.

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